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TITLE OF THE INVENTION

FLOOR COVERING FOR COVERING REMOVABLE FLOOR PANELS, FLOOR CONSTRUCTION WITH FLOOR COVERING, AND METHOD FOR PRODUCTION OF THE FLOOR COVERING

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

The present invention relates to a floor covering, a floor construction comprising removable floor panels covered with the floor covering, and to a method for producing the floor covering.

DISCUSSION OF THE BACKGROUND

Raised or installation floors are used in order to create a second plane that can support foot traffic or other loads above the subfloor of a room. Between the building's subfloor or bare floor and this second plane there is a void space created, which can be used for installation or laying of cables, pipes, air ducts, etc.

The plane for supporting foot traffic or other loads is very generally constructed from individual, usually square, support or floor panels. Such support or floor panels are braced relative to the building floor via a plurality of pedestals or underground structures. They are lined on the upper side with floor-covering tiles, which are fixed to the support panels in a slip-proof manner by a fixing adhesive.

In order to permit easy access to the underfloor installation for the purpose of undertaking maintenance tasks, it must be ensured that the floor-covering tiles can be

removed without problems. It must therefore be possible to loosen the fixing adhesive easily and without destroying it. Thus, a permanent bond is not appropriate.

Additional requirements may be imposed on the fixing adhesive, for example, provision of a conductive layer, in order to prevent leakage of electrostatic charges that may build up on the surface or to ensure that such charges are conducted to ground. Further requirements include ease of laying and good stability of the floor-covering tiles against slipping. For this purpose a coating layer of fixing adhesive, known as a "tackifier", is commonly applied on the laid base or support panels. An example is Thomsit T425 tackifier of the Henkel Co. or Forbo-Antirutsch 541 (Forbo anti-slip compound 541), on which the floor-covering tiles can be laid without becoming permanently bonded but without danger of slipping after a required setting time of about 30 to 120 minutes has elapsed. The fixing adhesive is based, for example, on an acrylate dispersion, into which optionally an additional conductive additive has been intermixed to ensure the desired conductivity. The acrylate dispersion is preferably an aqueous dispersion.

The problems which commonly occur during the laying of floor coverings described in the foregoing can be explained by referring to Fig. 1, which shows a schematic overhead view of a raised floor. It is evident that no adhesive is applied in the region of the joints (gap A in Fig. 1) between the support panels. As can be inferred from Fig. 1, it is only in this way that bonding of the support panels to one another can be avoided and the necessary easy access to the underfloor region can be ensured. In summary, the installation of such a floor is laborious, time-consuming and mistake-prone.

Once the base construction containing the floor panels has been laid, the fixing adhesive must be applied. In this process, care must be taken that, if at all possible, no adhesive is applied in the region of the abutting joints. On the other hand, sufficient adhesive must be applied in the region of the corners of the base panels, as shown in Fig. 1, in order to

fix the floor-covering tiles adequately and to provide a continuous layer.

Thereafter, the applied coating layer of fixing adhesive must be hardened or set. During this period, further processing is not possible. The necessary hardening time depends on ambient conditions such as atmospheric humidity, temperature, surface of the floor panels, etc. and is therefore difficult to determine. Thus, an unnecessary waste of time can result if the adhesive has already set, or - which is a much worse problem - the floor-covering tiles have become undesirably bonded to the support panels of the floor, so that the floor-covering tiles can no longer be lifted up without damaging them.

Finally, the floor-covering tiles must be laid without destroying the fixing adhesive layer, for example, by excessive foot traffic. Thus, the floor-covering tiles must be laid on the slip-proof adhesive, which can be achieved with the skill of a craftsman.

Because of the difficulties outlined in the foregoing, the entire laying process must therefore be performed manually by appropriately trained, skilled craftsmen, thus leading to high costs.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide an appropriately pretreated floor covering, that allows the floor-covering laying procedure to be streamlined by eliminating the time-consuming and mistake-prone process step of manually applying the adhesive or tackifier. The process should be performed externally and in advance by machinery, so that the floor can be installed inexpensively and precisely, even by less well trained personnel.

This and other objects have been achieved by the present invention the first embodiment of which includes a floor covering, comprising:

a non-conductive fixing adhesive uniformly applied on an underside of said floor covering;

wherein said non-conductive fixing adhesive has been air-cured to obtain a ready-to-lay floor covering.

In another embodiment, the present invention relates to a floor construction, comprising:

a floor covering as described above laid on a layer of floor panels laid flush with one another.

In yet another embodiment, the present invention relates to a method for production of a floor covering, comprising:

applying a non-conductive fixing adhesive onto a floor covering, to obtain a floor covering having said non-conductive fixing adhesive on at least one side;

air-curing said floor covering having said non-conductive fixing adhesive, to obtain an air-cured floor covering;

wherein an air-curing time is chosen such that a cohesion of said at least one side of said air-cured floor covering having said non-conductive fixing adhesive is stronger than a force of adhesion to a backing film subsequently applied.

In another embodiment, the present invention relates to a raised floor, a wooden floor or a bare floor, covered with a floor covering comprising:

a conductive or a non-conductive fixing adhesive uniformly applied on an underside of said floor covering;

wherein said conductive or non-conductive fixing adhesive has been air-cured to obtain a ready-to-lay floor covering.

In yet another embodiment, the present invention relates to a method for application of a fixing adhesive to a floor covering, comprising:

applying a first latex treatment on a back side of said floor covering, to obtain a first latex layer;

drying said first latex layer, to obtain a dried first latex layer;

applying a fixing adhesive;

drying said fixing adhesive, to obtain a dried fixing adhesive, with the proviso that said dried fixing adhesive remains elastic and tacky;

optionally attaching a protective backing film to said dried fixing adhesive.

BRIEF DESCRIPTION OF DRAWINGS

Fig. 1 shows a schematic overhead view of a conventional raised floor during the laying operation.

Fig. 2a shows a sectional side view of a conventional raised floor with applied fixing adhesive, but without floor covering.

Fig. 2b shows a sectional side view of a raised floor according to the present invention.

Fig. 3 shows a sectional side view of a floor covering according to the present invention.

Fig. 4 shows a perspective view of a floor-covering roll according to the present invention.

Fig. 5 shows a schematic view of a raised floor according to the present invention.

DETAILED DESCRIPTION OF THE INVENTION

A floor covering is pretreated according to the present invention by applying a fixing adhesive on its underside to obtain a ready-to-lay floor covering. This makes it is possible to achieve a considerable increase in efficiency during installation of the floor covering or the floor construction according to the present invention.

The fixing adhesive used in the present invention can be any adhesive that does not

bond to the underground on which the floor covering is laid. Preferably, the fixing adhesive is a pressure sensitive adhesive or repositionable adhesive. Even more preferably, the fixing adhesive is based on an acrylate dispersion. Optionally, the fixing adhesive can be conductive or antistatic. A coating layer of the fixing adhesive is applied on the floor covering such that the floor covering can be laid without the development of forces of cohesion and without bonding. Thus, the fixing adhesive functions as an adhesive without establishing an undestroyable connection with the underground. As a result, the fixing adhesive can be easily detached from the floor covering and can be reused. Preferably, the fixing adhesive does not dry and/or cure as a conventional adhesive and remains elastic and/or somewhat tacky. Preferably, a backing film is applied on the fixing adhesive coating layer to separate the opposite sites of the floor covering after finishing the floor covering, during rolling up the floor covering in the factory, during the transport to the site of use and/or during installation. As a consequence, even microscopic parts of the adhesive are prevented from attaching to the upper surface of the floor covering. However, in one embodiment, the adhesive coating layer may be protected by a backing film, so that excessive drying out of the fixing adhesive is prevented and, if required, the adhesive effect is preserved until the floor-covering tiles have been laid.

Preferably, the opposite sites of the floor covering do not attach to each other in the rolled-up condition to provide for easy rolling-off.

In the known processes, conductive or non-conductive pressure-sensitive adhesives have been applied on the bare floor, such as a concrete or plaster floor, a wooden floor or a false floor. After a preliminary drying time of about 10 to 20 minutes, the covering is inlaid in the pressure-sensitive or repositionable adhesive. According to the present invention, the fixing adhesive can be applied during a continuous or batchwise manufacturing process of a floor covering. The fixing adhesive is preferably applied to one side of the floor covering, but

can be applied to both sides. Preferably, the fixing adhesive can be applied after a first latex application during the production of textile floor coverings, such as suede, leather, polymeric fiber containing floor covering and natural fiber containing floor coverings. More preferably, the fixing adhesive may be applied to hard coverings, such as, PVC, linoleum and cork. In addition, the fixing adhesive may be applied to floor coverings which are stored as rolls for application on natural stone, cement, wooden floors or floors comprising a synthetic material. Natural stone includes granite and marble floors. Even more preferably, bare floors, such as concrete or plaster floors are used.

In one preferred embodiment the fixing adhesive is applied as a thin film on the floor by means of a lambskin roller. Within 10 to 20 minutes, the pressure-sensitive adhesive dries and the solvent, for example water, evaporates. Preferably, the composition of the adhesive is such that the fixing adhesive does not dry out completely and remains elastic and tacky.

The solvent may be removed from the fixing adhesive by any method. Quick removal of the solvent by irradiation with IR or UV light is preferred. Removal of the solvent with a drying device, such as a fan is particularly preferred. However, as indicated above, removal of the solvent does not result in complete drying of the fixing adhesive. For example, a commercially available fixing adhesive is applied in a liquid and highly viscous state (i.e. having a viscosity similar to that of honey) to the floor covering. The content of water evaporates and a fixing adhesive layer which is not entirely dry remains. Thus, the fixing adhesive remains elastic and tacky.

Preferably, the subfloor (concrete, floor topping, raised floor, etc.) is a finish-machined surface. Raised-floor panels are ground on the top side, and other subfloors are also ground or smoothed after installation and drying. If this were not the case, the roughnesses/raised areas on the subsequently laid floor covering would stand out and become visible.

that have not been coated/primed.

In the floor covering, the development of electrostatic charges due to friction on the floor acting as an insulating layer should be prevented or compensated by grounding via the floor. This can be achieved in a simple manner by using a tackifier with antistatic effect, obtained from an acrylate dispersion having an electrically conductive additive. A satisfactory antistatic effect is achieved if, for example, carbon, for example, in the form of carbon black, is mixed as an electrically conductive additive in a proportion of up to 25% by weight in the adhesive based on an acrylate dispersion. Other substances or substance mixtures having the desired adhesive and/or antistatic properties can be used in the scope of the present invention. In general, the amount of tack reducing additive is up to 25% and includes all values and subvalues between 0 and 25% by weight, especially including 5, 10, 15, 20, and 25 % by weight.

In the residential sector, a non-conductive pressure-sensitive adhesive is preferred. These types of pressure-sensitive adhesive have high tack, resulting in the danger that prolonged, intensive traffic on the covering may increase the adhesion to the base layer so much that it can be regarded as bonded. However, such bonding is undesirable because the coverings should be easily removable for replacement purposes.

One way to reduce the tack of the pressure sensitive adhesive is to include up to about 35% by weight of a tack reducing additive such as carbon powder. The amount of tack reducing additive includes all values and subvalues between 0 and 35% by weight, especially including 5, 10, 15, 20, 25 and 30 % by weight. The tack is reduced to the point that the covering or floor tiles can be removed without problems. Depending on the added quantity of carbon powder, the fixing adhesive may become conductive, and at the same time it loses tack. On the other hand, for a non-conductive fixing adhesive, organic or inorganic fillers, preferably chalk are added to the pressure-sensitive adhesive to reduce tact. The amount of

organic or inorganic fillers for tack reduction is up to 35% by weight based on the weight of the pressure sensitive adhesive, and includes all values and subvalues between 0 and 35% by weight, especially including 5, 10, 15, 20, 25 and 30% by weight. Both, the conductive or non-conductive fixing adhesive may contain an organic or inorganic filler.

Another advantage of the present invention is achieved when retrofit operations are undertaken in the floor under the floor panels, such as the laying of cable runs. In this case, the floor covering must be lifted off and the floor-covering panels removed and stacked off to the side. Heretofore, the electricians have usually walked on the bare floor while performing laying tasks, thus inevitably picking up dust on the soles of their shoes and tracking it onto the exposed adhesive surface when they step out of the duct. This problem is effectively eliminated with the structure of the floor covering of the present invention. According to the present invention, the floor panels are no longer treated with adhesive, they can be simply vacuumed on completion of the retrofit or modification tasks. The undamaged floor covering, for example, in the form of covering tiles with underside coating, can be relaid without impairment of their function.

Finally, a further advantage of the present invention becomes clear when the floor covering has to be replaced. Because the floor covering is not permanently bonded to the base course, such as floor topping, no part of the base course is torn up during replacement of the covering, and so there is effectively no need for troweling work. Furthermore, no residual adhesives, which heretofore had to be ground off, are left there. This opens up the opportunity to use the technique according to the present invention with all its advantages even when floor coverings sold by the meter are being laid.

Furthermore, the floor covering according to the present invention can be produced by a simple method. The environmental parameters are adjustable, and the setting time of the applied tackifier coating layer can be precisely maintained and its thickness can be kept

constant at the optimal value, so that the desired functionality of the adhesive coating layer as a tackifier but not as a bonding agent is achieved with great reliability. The method can also be performed as a continuous process, thus allowing further cost reductions to be achieved.

The floor covering according to the present invention offers the further advantage that, when packaged in the form of rolls, it is suitable both for direct laying in hand-cut sections and as a commercial precursor product, which can be the starting material for other commercial products in the form of variously sized floor-covering tiles, without the need for changeover times on appropriate machines during its production. Thus, from the floor covering, which can also be sold by the meter, ready-to-lay floor-covering tiles can be produced by a single operation, in which the floor covering is divided in a manner to be adjusted to the desired tile size, or floor-covering tiles are stamped out from the floor covering.

Furthermore, there is no longer any need to take special care with the butt joints of the floor layout or of the laid floor panels during laying of the inventive floor covering or floor-covering tiles, since the adhesive or tackifier is largely hardened or set. The risk of bonding of the base panels of the floor to one another is therefore effectively ruled out, and the function of a floor construction of the present invention, especially of a raised floor, in order to provide an installation space that is rapidly accessible but concealed from view, can be achieved with great reliability and little time expenditure.

Furthermore, better adhesion of the floor covering to the floor panels is also achieved in this way, since the floor covering is uniformly coated with tackifier. Thus, adhesion of the floor covering to the floor panels is ensured, even in the regions of the butt joints of the base panels, without the risk that the floor panels will become bonded to one another, since the fixing adhesive has already set by the time of the laying operation.

Particularly good adhesion is achieved when the floor covering is laid in such a way

that it overlaps the butt joints of the base panels. This is achieved in a particularly simple way when its size is different from that of the floor panels.

The fixing-adhesive coating layer continues to adhere to the floor covering and is not transferred to the floor panels when the floor covering is lifted up to gain access to the underfloor. Specifically, the fixing adhesive coating layer bonds to the floor covering during the production according to the present invention and must have a natural cohesion that is stronger than the force of adhesion between the adhesive coating layer and the floor panels.

This can be accompanied by measures such as provision of a smooth surface or of an appropriate upper-side coating or of impregnation of the floor panels.

The individual features of the above embodiments can be combined as desired if it seems technically practical.

Preferred embodiments of the present invention will be explained in more detail hereinafter with reference to the drawings.

Fig. 1 shows a schematic overhead view of a conventional raised floor during the laying operation. The procedure for laying of conventional floor-covering tiles on a floor panel forming a raised-floor plane is evident in Fig. 1. A coating layer of fixing adhesive is applied on floor panels disposed flush with one another along corresponding butt joints 3 and resting via their respective corners on one quarter of the surface of round pedestal heads. Region A along butt joints 3 is left clear, but fixing adhesive is again applied at the corners of the panels. Some floor-covering tiles that have already been laid are indicated by hatched areas.

Fig. 2a shows a section of a conventional raised floor while the tackifier is setting. A pedestal head 4 is seated on a pedestal 5. Floor panels 1 rest via their respective corners on pedestal head 4. Between panels 1 there are disposed joints 3, in the area of which (see gap A) no adhesive 2 is applied, in contrast to the rest of the upper side of the floor panels. After

hardening or setting of the adhesive, conventional floor-covering tiles can be applied thereon.

In contrast to this, in the section of a raised floor according to the present invention shown in Fig. 2b, floor covering 6 with fixing adhesive 2 applied on its underside is already laid on floor panels 1, and so joints 3 are also overlapped with adhesive coating layer 2. The floor panels are braced via pedestal heads 4, to the underside of which there are joined pedestals 5. In this way, a rapidly accessible clear void space for ventilation shafts, network installations, etc. is provided underneath the floor panels.

Floor covering 6 is used as covering for the floor panels as illustrated in Fig. 3. Floor covering 6 has a continuously applied adhesive coating layer 2 protected by a film 7 that can be easily peeled off.

Fig. 4 shows a floor covering 6 rolled up as a roll 6b ready for retail. Floor-covering tiles 6a to be punched out are also indicated by broken lines on a portion that has now been unrolled.

Fig. 5 shows a raised floor installed using floor-covering tiles 6b (indicated by dot-dash lines) according to the present invention for comparison with the conventionally laid raised floor shown in overhead view in Fig. 1. The pedestal heads denoted by 4 support floor panels 1, on which there are fixed floor-covering tiles 6b with fixing adhesive 2 applied flatly on the underside thereof (see Figs. 2b, 3). A ventilation shaft 11 is shown by broken lines. This ventilation shaft runs in the void space between the plane of the floor panels and the plane of the base floor (such as the concrete slab) and is supposed to be kept accessible. It is also evident that floor-covering tiles 6b have a size which is different from (larger than) that of floor panels 1, thus largely ensuring that joints 3 between floor-covering panels 1 are overlapped by floor-covering tiles 6a.

From the foregoing description it follows that the floor covering, such as the floor-covering tiles, does not have to be cut to match the pattern in which the floor panels are laid.

In other words, the pattern of the raised-floor panels can be, but is not required to be, identical to that of the coated floor-covering tiles.

Furthermore, the present invention allows the manufacture of floor coverings and their laying with pressure-sensitive adhesives. A number of advantages can be realized with floor coverings such as PVC, linoleum, tufted tile covering, velour covering.

The back side of velour coverings used, for example, for the residential sector, is produced as follows: a first latex treatment is applied on a foamed back side and dried. Then, a jute or synthetic fabric is attached by rolling, followed by a second latex treatment and drying. According to the present invention, the liquid pressure-sensitive adhesive is applied immediately after the application and drying step of the first latex treatment. After drying, a protective backing film is attached to prevent detached spots of pressure-sensitive adhesive from coming into contact with the velour surface, for example, when the covering is rolled up. The velour covering can then be trimmed laterally to finished size, at which point it is ready to be rolled up for shipping.

The process according to the present invention can take advantage of existing production facilities because the fixing adhesive is applied and drying, for example, UV drying, takes place immediately after the first latex treatment has been applied and dried. To ensure that no particles of pressure-sensitive adhesive are found on the finished carpet surface during the rolling-up step, and to prevent adhesion to the finished top side of the covering, a film coating (separating layer) is applied. This has nothing to do with further drying out of the fixing adhesive, since the fixing adhesive is durably elastic and tacky.

In principle, PVC covering has no coating on the back side. The coating of pressure-sensitive adhesive is therefore preferably applied during the manufacturing process.

In the case of PVC, linoleum, cork, etc., precoating may not be necessary. The adhesive can be applied directly onto the back side and dried by UV drying, for example. A

film coating is preferred, to ensure that no particles of pressure-sensitive adhesive are found on the finished floor covering during the rolling-up and to ensure that the covering does not cling together when the covering is rolled up or when subsequently cut tiles are stacked.

In conventional linoleum floor coverings, a jute fabric is inlaid into the back side during the final production cycle. However, if the linoleum is treated with the pressure-sensitive adhesive according to the present invention, it is no longer necessary to include a jute fabric layer during the manufacturing process.

Depending on the viscosity of the pressure-sensitive adhesive, an intermediate coating may be applied to a tufted tile covering, so that the pressure-sensitive adhesive, while still in fluid condition, does not penetrate into the floor covering. On the other hand, immediate infrared drying can be performed during application of the pressure-sensitive adhesive at the manufacturer's factory.

In the case of tufted tile coverings, a preliminary latex treatment may be beneficial, since latex is very highly viscous and inexpensive, and dries rapidly and easily. A directly applied fixing adhesive would penetrate immediately into the rough back side of the covering and would act as a sealing/impregnation agent in the case of base courses. A second or even third coating of fixing adhesive would then have to be applied in order to obtain a continuous coating of pressure-sensitive adhesive on the back side of the covering. For this type of covering, however, it is also possible to apply other precoatings, which smooth out the back side of the covering and preclude immediate penetration of the fluid fixing adhesive.

Having generally described this invention, a further understanding can be obtained by reference to certain specific examples which are provided herein for purposes of illustration only, and are not intended to be limiting unless otherwise specified.